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Nanoparticles deliver the goods and leave without a trace

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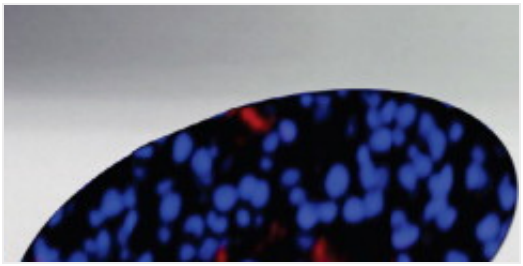
Researchers have come up with a new type of non-toxic nanoparticle

Researchers from California and Massachusetts have come up with a new type of non-toxic nanoparticle (NP) that is efficiently broken down and excreted by the kidneys once it has delivered its drug cargo to the target organ [Park, *et al., Nat. Mater.* (2009), doi: 10.1038/nmat2398].

There is already a significant amount of research on drug delivery using NPs, but some of these systems suffer from major drawbacks, such as the body's immediate rejection of NPs before they can deliver their payload, or biodegradability and toxicity of the NPs or their by-products. However, the use of NPs for drug delivery remains of major interest because these small bodies have some exceptional properties. NPs have a large specific capacity for loading drugs, they are easily detected while they are in the body, and they are retained by the blood stream long enough for them to reach their target and offload the drug.

The new 126 nm luminescent porous Si NPs (LPSiNPs) are fabricated by electrochemical etching of single-crystal Si wafers, followed by ultrasonication and filtration to obtain NPs with 5–10 nm pore diameters. Silicon oxide grown onto the surface of LPSiNPs gives them an intrinsic photoluminescence at 650–900 nm. This makes them suitable for in vivo applications as organs and tissues exhibit very low adsorption in this region and any photoluminescence can be attributed to the LPSiNPs. The luminescent material is much more photostable than fluorescein or cyanin fluorophores and has a quantum yield comparable to other water-soluble luminescent silicon-silica NPs.

In vivo tests have been carried out by the researchers who incorporated an anti-cancer drug – doxorubicin – into LPSiNPs (DOX-LPSiNPs) and injected the DOX-LPSiNPs into mice. Photoluminescence indicates that the DOX-LPSiNPs reach the tumor, where they build up. Histology of the tissues also confirms the presence of the drug together with LPSiNPs inside the tumor. The LPSiNPs then break down, most probably into soluble silicic acid and are completely eliminated from the body by renal clearance within 1–4 weeks of injection, without any signs of toxicity in the



Luminescent Silicon nanoparticles

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